



The International Whaling Commission—Beyond Whaling

Andrew J. Wright^{1*}, Mark P. Simmonds² and Barbara Galletti Vernazzani³

¹ Department of Environmental Science and Policy, George Mason University, Fairfax, VA, USA, ² School of Veterinary Sciences, University of Bristol, Bristol, UK, ³ Centro de Conservacion Cetacea, Santiago, Chile

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*Correspondence:

Andrew J. Wright
marinebrit@gmail.com

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Since its establishment in 1946 as the international body intended to manage whaling, the International Whaling Commission (IWC) has expanded its areas of interest to ensure the wider conservation of whales. Several key conservation topics have been taken forward under its auspices including climate change, chemical and noise pollution, marine debris and whale watching. Work on each of these topics at the IWC has grown substantially since the 1990s and remains ongoing. Important developments were the establishment of the Standing Working Group on Environmental Concerns in 1996 and the IWC's Conservation Committee in 2003. Trying to address this diverse set of issues is obviously a challenge, but will be necessary if the long term conservation of cetaceans is to be achieved. Through research, workshops, resolutions and collaboration with other organizations, the IWC has advanced both the understanding of the various issues and the means to manage them with increasing effectiveness. The IWC is likely to remain on the forefront of continuing efforts to address these, and other, conservation concerns and ensure the continued viability of cetacean populations around the globe.

Keywords: International Whaling Commission, conservation, climate change, marine debris, ship strike, underwater noise pollution, Whale watching, chemical pollution

INTRODUCTION

The International Convention for the Regulation of Whaling established the International Whaling Commission (IWC) in 1946 with the stated purpose to “provide for the proper conservation of whale stocks and thus make possible the orderly development of the whaling industry” (International Convention for the Regulation of Whaling, 1946). Over time, concern over impacts from non-whaling threats has expanded the topics under discussion at the IWC. Key expert opinion on subjects related to the conservation of all cetaceans is now frequently distilled in the IWC's Scientific Committee (IWCSC). This expansion led India's Commissioner to suggest that the IWC be re-named the International Whales Commission in 2012 (IWC, 2013c).

A critical step in this development was the creation of the “Environmental Concerns Standing Working Group (ESWG)” under the IWCSC in 1996 to “facilitate examination of the effects of environmental change on cetaceans,” following Commission Resolution 1996–8 (IWC, 1997a). Two years later, the IWCSC placed environmental concerns centrally in their visual representation of their seven priority topic areas (Figure 1 in IWC, 1999a) and the Commission adopted a standing Agenda Item on “Environmental Concerns” (IWC, 1999b). The next major development was the 2003 establishment of the Conservation Committee to consider numerous emerging cetacean conservation issues (IWC, 2004c).

The evolving and expanding focus of the IWC is reflected in its Resolutions, as reviewed in the 2003 Annual Report (IWC, 2004c). Complementing that retrospective, this review provides a look back at the evolving role of the IWC in several topic areas over the last two decades.

WHALE WATCHING

Despite noted educational (IFAW et al., 1997), cultural (Hoyt and Iñiguez, 2008), and direct and indirect economic (Hoyt and Iñiguez, 2008; O'Connor et al., 2009; Cisneros-Montemayor et al., 2010) benefits, concerns have arisen over the negative effects of whale watching on the targeted species and populations. The IWCSC first expressed concern about the commercial tourist operations in gray whale (*Eschrichtius robustus*) breeding lagoons in Mexico in the 1970s (IWC, 1975). The first IWC Resolution (1993-9) on whale watching came in 1993, establishing a Working Group and inviting IWC members to contribute scientific and economic information on this expanding tourist industry (IWC, 1994). The ongoing discussion of scientific, legal, socio-economic, and educational aspects of the issue by the scientists, governments, non-governmental organization (NGOs), tour operators and other stakeholders gathered at the IWC has since, among other things, produced a framework to assist coastal states in drafting whale watching guidelines and regulations (IWC, 2004a).

In 1998, the Whale Watching Sub-Committee (WWSC) was established (following Resolution 1996-2) under the IWCSC (IWC, 1997b). This Sub-Committee considers any relevant information pertaining to whale watching and swim-with programs. Since 1999 the WWSC has systematically compiled relevant regulations and guidelines from around the world (Carlson, 2013). The WWSC also held a workshop specifically to assess long-term effects of whale watching on cetaceans (IWC, 2001b).

Perhaps most notably, in 2007, Resolution 2007-3 recognized the “non-lethal use [of cetaceans] as a legitimate management strategy” and encouraged “member States to work constructively toward the incorporation of the needs of non-lethal users of whale resources in any future decisions and agreements” (IWC, 2008a). A 2008 IWCSC workshop followed to discuss strategic planning of large-scale whale watching research to improve long-term impact studies (IWC, 2009a).

The Conservation Committee established its own Working Group on Whale Watching in 2009, initially to produce a draft strategic plan. The IWC subsequently adopted the 5 year Strategic Plan 2010–2015 on whale watching, with elements that addressed science, management, and capacity building (IWC, 2011a). Among other things the Strategic Plan produced a web-based “living” handbook on whale watching (Carlson, 2013).

Operators were invited to the IWC to provide feedback on the Strategic Plan in 2013. They concluded the IWC should take a more active role in advising sustainable whale watching activities, especially in developing countries (IWC, 2013a). Relatedly, a process is underway to review progress on previous recommendations and find ways to improve resolution visibility and effectiveness, especially those concerning “highly endangered or isolated cetacean species/populations” (IWC, 2015a). Most recently, in February 2016, the IWC provided technical and logistic support for a workshop on whale watching held by the Indian Ocean Rim Association in Sri Lanka (Simmonds pers obs).

CHEMICAL POLLUTION

A long-accepted environmental concern, it is perhaps unsurprising that chemical pollution has arguably received more attention than any other non-whaling issue at the IWC. Following the 1995 IWC Pollution Workshop (Reijnders et al., 1999), Commission Resolution 1997-7 initiated a multi-national, multi-disciplinary research programme to establish pollutant cause-effect relationships in cetaceans (IWC, 1998). Strongly endorsed by the Agreement on the Conservation of Small Cetaceans in the Baltic, North East Atlantic, Irish, and North Seas (ASCOBANS) and the International Council for the Exploration of the Sea (ICES) Working Group on Marine Mammal Habitats, the initial proposal was refined through three meetings (IWC, 2000b), ultimately becoming known as “POLLUTION 2000+,” to focus on polychlorinated biphenyls (PCBs) in harbor porpoises (*Phocoena phocoena*) and bottlenose dolphins (*Tursiops* sp.; IWC, 2000b).

POLLUTION 2000+ Phase I objectives were to validate/calibrate methodology to: (a) determine changes in concentration of biomarkers of PCB exposure with post-mortem times; and (b) examine relationships between biopsy sample concentrations with those from other tissues only available from fresh carcasses (IWC, 2000b). Initially heavily supported by the SOWER (Southern Ocean Whale and Ecosystem Research) programme, POLLUTION 2000+ also drew considerable (although arguably insufficient) funding from the IWC and elsewhere (IWC, 2001a). Consequently, upon completion in 2006, the IWCSC agreed that Phase I had contributed to the Commission’s request to give priority to research on effects of environmental changes on cetaceans (IWC, 2007b). The program had created the first individual-based model for a cetacean (the bottlenose dolphin) simulating PCB accumulation in a population, with modification of first-year calf survival based on maternal blubber PCB levels. Phase I had also laid the foundation for the use of incidentally caught animals in pollutant studies.

Phase II began in 2007 by concentrating on developing: (1) an integrated modeling framework to examine the effects of pollutants on cetacean populations; and (2) a protocol for validating the use of biopsy samples in pollution-related studies (IWC, 2008b). Experts in chemical contaminants, toxicology, cetacean biology, veterinary medicine, and biomarkers refined objectives over several years (IWC, 2011b,c) and the first elements of Phase II were ready for IWCSC review in 2011 and 2012 (IWC, 2012a, 2013b). Phase II efforts received IWCSC commendation, as “population-level consequences of pollutant exposure in cetaceans are extremely difficult to determine directly” (IWC, 2012a).

The IWC also continued discussion of contaminants outside POLLUTION 2000+. For example, Resolution 1999-4 called on “relevant countries to take measures to reduce pollution that may cause negative health effects from the consumption of cetacean products,” among other things (IWC, 2000b). The inconclusive 2005–2011 Russian investigation into inedible “stinky” gray whales found in the Chukotkan aboriginal subsistence hunt has

also been repeatedly discussed (Polyakova et al., 2012; IWC, 2013c).

More recently, the 2010 Deepwater Horizon oil spill has featured prominently, initially overshadowing POLLUTION 2000+. Discussions focused on the possible impacts of oil and dispersants, and the prolonged elevation of dolphin strandings in the Gulf of Mexico into 2013 (IWC, 2012a, 2013b, 2014a). Acknowledging the uncertainties, the Commission made a general statement in support of research on the wide impacts of contaminants on marine mammals and their environment with Resolution 2012-1 (IWC, 2013c).

By 2013, POLLUTION 2000 Phase II was approaching completion, having developed stochastic models of population-level impacts of contaminant bioaccumulation and offered a risk assessment (IWC, 2014a). The IWCSC thus established a steering group to plan Pollution 2020, in effect a POLLUTION 2000+ Phase III, which will focus on assessing the toxicity of microplastics and polycyclic aromatic hydrocarbons and dispersants in cetaceans (IWC, 2014a).

CLIMATE CHANGE

The first climate change workshop took place in 1995 to review and consider potential threats to cetaceans posed by a changing climate following a 1993 call from the IWCSC (Ashford-Hodges and Simmonds, 2014). The workshop concluded that climate change would adversely affect cetaceans, with the most important impacts expected to be mediated via prey distribution changes. It also noted that current climate change models had predictive capability limitations and that considerable further research would be required to accurately predict impacts of climate change on cetaceans.

In 2002, the IWCSC designated high latitude climate change as a priority topic for future work for ESWG (IWC, 2003b). A special session on Southern Ocean climate change and cetaceans was held in 2003 (IWC, 2004c). However, a second climate change workshop was not convened until 2009 with the primary goal of determining how to improve conservation under the 4th Intergovernmental Panel on Climate Change (IPCC) Assessment on Climate Change scenarios (IPCC: Pachauri and Reisinger, 2007). Recommendations included developing more accurate models of cetacean responses to climate, with explicitly quantified uncertainties, and improving understanding of relationships between cetacean distribution and quantifiable climatic indices (e.g., sea surface temperature: IWC, 2010b). Commission Resolution 2009-1 followed, requesting Contracting Governments to both incorporate climate change considerations into existing conservation and management plans and take urgent action to reduce the rate and extent of climate change (IWC, 2010a).

Participants of a further workshop on the impacts of climate change on small cetaceans expressed particular concern for species with restricted habitats, stressing the importance of long-term datasets for assessing such impacts (IWC, 2012b). The IWCSC established a steering group in 2014 to provide recommendations on how to take work on this topic forward (IWC, 2015b).

MARINE NOISE

Among increasing scientific concern, two overview papers submitted to ESWG initiated IWC discussions of noise in 1998. The IWCSC agreed at that time “attempting a major initiative on the impact of noise on cetaceans was not advisable” (IWC, 1999a) and the Commission accepted this conclusion (IWC, 1999c).

Regardless, ongoing discussions of impacts of noise continued, initially focusing on acoustic deterrent devices, or “pingers,” whale watching vessels and seismic surveys (IWC, 2000a, 2002). The potential contributions of noise to habitat abandonment by humpback whales (*Megaptera novaeangliae*) in the Gulf of Paria and threatened Western North Pacific gray whales (*Eschrichtius robustus*) of their Piltun feeding ground (IWC, 2002) led to a joint WWSC-ESWG session on noise in 2002 (IWC, 2003a). Notably, this discussion represented one of the first international gatherings of scientists dedicated to the topic of underwater noise.

In 2003, the Commission used the term “noise pollution,” the ESWG established noise as regular agenda item, and the IWCSC broadened its discussions to include windfarm construction and anthropogenic noise more generally (IWC, 2004b). A dedicated ESWG mini-symposium in 2004 commended Brazilian Government efforts to protect critical habitats from seismic survey noise, and strongly recommended similar protections elsewhere (IWC, 2005a). The Commission endorsed IWCSC findings that there was “now compelling evidence implicating military sonar has a direct impact on beaked whales in particular,” and that “other sources... were cause for serious concern” (IWC, 2005a,b). IWCSC discussion of naval activity continued into 2006 following a mass stranding of beaked whales in Taiwan, while a workshop focusing on seismic impacts substantially expanded the body’s acoustic expertise (IWC, 2007a). Workshop conclusions highlighted the need for better planning, reduced horizontal energy output, and additional well-designed long-term monitoring studies (IWC, 2007a).

By 2008, IWCSC observers were regularly reporting on external resolutions and recommendations (IWC, 2009a). Among other things, the IWCSC endorsed a call for shipping noise reductions “in the 10–300 Hz band by 3 dB in 10 years and by 10 dB in 30 years relative to current levels” (IWC, 2009a). An Agreement of Cooperation between the International Maritime Organization (IMO) and the IWC followed in 2009, granting the IWC observer status at the IMO. Immediately, the IWCSC strongly supported recommendations for ships to incorporate low-noise propulsion designs, among other measures (IWC, 2011b).

As information accumulated, the IWCSC concluded there was “considerable evidence that anthropogenic noise can affect beaked whales” (IWC, 2012a) and strongly recommend that “military exercises and seismic surveys should avoid areas of important habitat for beaked whales” (IWC, 2013b). In 2013, a joint ESWG-WWSC session further considered ship noise (IWC, 2014a) eliciting the IWCSC recommendation for additional examination of possible population-level effects from behavioral responses (IWC, 2015a). A joint IWC-IQOE (International Quiet Ocean Experiment) technical workshop on soundscape modeling

followed (IWC, 2015a). While undoubtedly an excellent start, the limited geographical coverage of soundscape programs was noted, as was the need for standardization (IWC, 2015a).

Multi-beam echosounders entered discussions following implication in the 2008 Madagascar melon-headed whale (*Peponocephala electra*) mass stranding (Southall et al., 2013). The IWCSC responded by recommending high intensity multi-beam echosounder systems, like military sonars, be considered possible threats to cetacean populations (IWC, 2015a). More generally, the IWCSC stressed the importance of temporal and spatial management and recommended that Governments encourage commercial use of noise-reducing technologies (IWC, 2015a).

MARINE DEBRIS

Increasing recognition of the near-ubiquitous presence of marine debris in the oceans, and the huge potential for wildlife impacts (e.g., NOAA Marine Debris Program, 2014; NOAA, 2015), led the IWC to hold two marine debris workshops in quick succession. The 2013 workshop focused on improving understanding of the threat posed by marine debris to cetaceans and discussed impacts from both macrodebris (e.g., fishing gear, plastic bags, and sheeting) and microplastics (e.g., plastic particles added to cosmetics and the pellet form of raw plastics). The IWCSC endorsed the recommendation for more research (IWC, 2014b). The IWCSC also agreed that: (1) legacy and contemporary marine debris have the potential to be persistent, bioaccumulative and lethal to cetaceans, and thus represent a global management challenge; and (2) entanglement in, and intake of, active fishing gear, ALDFG (abandoned, lost, or otherwise discarded fishing gear) and other marine debris have lethal and sub-lethal effects on cetaceans (IWC, 2015a).

The 2014 workshop gathered several key international bodies already engaged in marine debris principally to discuss a role for the IWC. It was agreed that the IWC's primary contribution should be to ensure that cetacean-related issues are adequately represented within existing initiatives and that its strong scientific expertise is made available in collaborative efforts (IWC, 2014d). Thus, these workshops likely represent merely the beginning of IWC work on this issue.

SHIP STRIKES

Ship strikes rose to prominence at the IWC with Resolution 1998-2, which specified, for the first time, that collisions with ships and other sources of human-induced mortality should be counted toward total allowable removals (IWC, 1999c). Discussions continued into the new millennium, focusing on high-speed vessels, United States and Canadian right whale (*Eubalaena glacialis*) ship strike-reduction efforts, and disappointments with acoustic alarms (IWC, 2000b, 2001a). Meanwhile, early IWC Secretariat approaches to the IMO were rebuffed as the IWC did not have observer status at that time.

The Conservation Committee established the Ship Strikes Working Group (SSWG) in 2005 (IWC, 2006). Quickly the SSWG recommended a combination of four technical mitigation

measures: detection and avoidance maneuvers; repulsion; protection; and training (IWC, 2007b), and initiated the IWC Global Ship Strikes Database, which had reached 763 records by 2008, mainly from published sources (IWC, 2009b).

Following the 2009 formal Agreement with the IMO, the IWC has contributed to IMO discussions on ship strikes (in addition to underwater noise), leading to the adoption of shipping lane changes in the Santa Barbara Channel and off San Francisco, California, USA, to reduce blue whale ship strikes, among other things (IMO, 2012). The Conservation Committee contributed greatly to this collaboration, while continuing to build the database and raise awareness globally. It also contributed to the 2010 joint IWC-ACCOBAMS (Agreement on the Conservation of Cetaceans in the Black Sea Mediterranean Sea and Contiguous Atlantic Area) workshop on ship strikes in the Mediterranean Sea and the Canary Islands (IWC, 2010a).

Despite some regional progress, workshop participants noted the data necessary for carrying out full risk assessments and determining appropriate conservation actions were generally lacking, especially within the ACCOBAMS region (IWC, 2011d). Participants recommend additional data collection, increased reporting to the IWC database, and greater international collaboration on the issue (IWC, 2011d). These were echoed by both the IWCSC and Commission (IWC, 2012c).

In response, the Commission approved IWCSC, and subsequently Conservation Committee, recommendations to appoint a part-time dedicated ship strike data coordinator (IWC, 2012c, 2013c). The Commission also committed to contributing to three further workshops on disentanglement and ship strikes in the wider Caribbean in 2012-13 (IWC, 2013c).

A further IWC-endorsed workshop in Tenerife focused on management and mitigation of ship strikes (Tejedor et al., 2013). This highlighted the need to define and communicate “whale hotspots,” for better advanced route planning, a subject to be pursued further by a subsequence workshop (IWC, 2014c).

RESERVATIONS

While some have questioned IWC authority over non-whaling topics (especially when the Conservation Commission was created), the majority of member nations have supported the broadening focus (e.g., by passing resolutions). However, three countries have recently made specific statements indicating their belief that certain items are outside IWC jurisdiction. For example, in 2015 Japan, Iceland and Norway stated to the IWCSC their opposition to marketplace monitoring of whale meat products (e.g., DNA register systems) and Japan additionally opposed consideration of “whale watching” and “small cetaceans” (IWC, 2016). In practice scientists sent to the IWCSC by these nations do not take part in discussions on these topics, which still proceed. Japan also does not participate in the Conservation Committee.

CONCLUSIONS

With increasing scientific acknowledgement that multiple stressors can produce cumulative impacts (e.g., Wright, 2009),

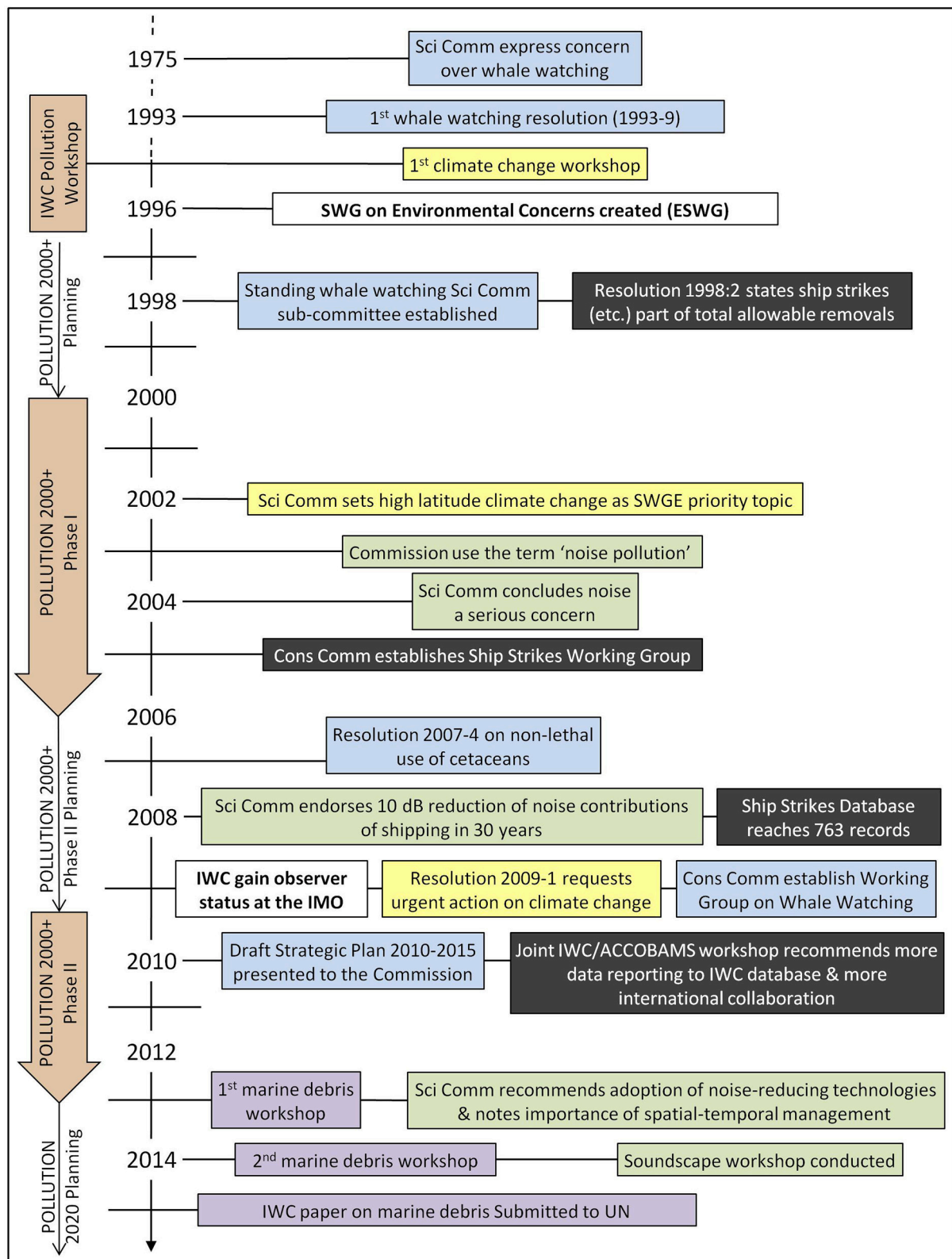


FIGURE 1 | Notable events in the expansion of subjects under consideration at the IWC.

management decision must consider broader human impacts as whaling does not occur in a vacuum. This review is limited to the progress made to date on certain issues (see **Figure 1**), but the IWC also has ongoing work streams on emergent diseases, whale disentanglement, marine renewable energy devices, and various other environmental and conservation concerns.

While not exhaustive, this review demonstrates that important contributions to the conservation of cetaceans and their habitats are increasingly being made between actors from many nations within the fora provided by the IWC. It is clear that this “modern” IWC will continue to facilitate key efforts to address the many threats now challenging

the survival of viable, healthy cetacean populations around the world.

AUTHOR CONTRIBUTIONS

All authors contributed original text to the manuscript. MPS initiated the concept. AJW compiled, edited, and (for the most part) referenced the material.

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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